WHAT IS CLAIMED IS:

1. A DNA encoding avermectin aglycon synthase.

2. A DNA comprising a nucleotide sequence selected from the group consisting of nucleotide Nos. 1-11916 and 11971-30688 of SEQ ID NO: 1 and nucleotide Nos. 1-14643 and 14824-31419 of SEQ ID NO: 2; or
a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having avermectin aglycon synthase activity.

3. The DNA according to claim 1 or 2 wherein the DNA comprises DNAs encoding avermectin aglycon synthase domains.

4. The DNA according to claim 3 wherein the DNAs encoding avermectin aglycon synthase domains are selected from the group consisting of:
a DNA encoding a polypeptide having acyltransferase activity and acyl carrier protein activity;
a DNA encoding a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, β-ketoacyl-ACP reductase activity and acyl carrier protein activity;
a DNA encoding a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, dehydratase activity, β-ketoacyl-ACP reductase activity and acyl carrier protein activity;
a DNA encoding a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, and acyl carrier protein activity; and
a DNA encoding a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, dehydratase activity, β-ketoacyl-ACP reductase activity, acyl carrier protein activity, and thioesterase activity.

5. The DNA according to claim 4 wherein the DNA encoding a polypeptide having acyltransferase activity and acyl carrier protein activity is the DNA comprising a nucleotide sequence of nucleotide Nos. 85-1353 of SEQ ID NO: 1; or
a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having acyltransferase activity and acyl carrier protein activity.

6. The DNA according to claim 4 wherein the DNA encoding a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, β-ketoacyl-ACP reductase activity, and acyl carrier protein activity is:
a DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 1441-6180, 15217-19938 and 20008-24690 of SEQ ID NO: 1, and nucleotide Nos. 100-4692 and 14935-20334 of SEQ ID NO: 2; or
a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, β-ketoacyl-ACP reductase activity, and acyl carrier protein activity.

7. The DNA according to claim 4 wherein the DNA encoding a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, dehydratase activity, β-ketoacyl-ACP reductase activity, and acyl carrier protein activity is:
a DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 6256-11658 and 24781-30309 of SEQ ID NO: 1, and nucleotide Nos. 20413-25734 and 25810-31125 of SEQ ID NO: 2; or
a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, dehydratase activity, β-ketoacyl-ACP reductase activity, and acyl carrier protein activity.

8. The DNA according to claim 4 wherein the DNA encoding a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, and acyl carrier

protein activity is:

a DNA comprising the nucleotide sequence of nucleotide No. 12076-15147 of SEQ ID NO: 1, or nucleotide No. 4771-7818 of SEQ ID NO: 2;

or a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, and acyl carrier protein activity.

9. The DNA according to claim 4 wherein the DNA encoding polypeptides having β-ketoacyl-ACP synthase activity, acyltransferase activity, dehydratase activity, β-ketoacyl-ACP reductase activity, acyl carrier protein activity, and thioesterase activity is:

a DNA comprising the nucleotide sequence of nucleotide Nos. 7906-14619 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, dehydratase activity, β-ketoacyl-ACP reductase activity, acyl carrier protein activity, and thioesterase activity.

10. The DNA according to claim 4 wherein the DNA encoding a polypeptide having acyltransferase activity is:

a DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 85-1032, 7906-8829, 13756-14694, 16917-17862, 21658-22584, and 26413-27336 of SEQ ID NO: 1, and nucleotide Nos. 1648-2673, 6322-7344, 9676-10773, 16543-17565, 21991-23019 and 27367-28392 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having acyltransferase activity.

11. The DNA according to claim 4 wherein the DNA encoding a polypeptide having acyl carrier protein activity is:

a DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 1096-1353, 5935-6180, 11413-11658, 14902-15147, 19693-19938, 24445-24690 and 30064-30309 of SEQ ID NO: 1, and nucleotide Nos. 4447-4692, 7573-7818, 13378-13659, 20089-20334, 25489-25734 and 30880-31125 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having acyl carrier protein activity.

12. The DNA according to claim 4 wherein the DNA encoding a polypeptide having β-ketoacyl-ACP synthase activity is:

a DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 1441-2742, 6256-7545, 12076-13368, 15217-16506, 20008-21297 and 24781-26079 of SEQ ID NO: 1, and nucleotide Nos. 100-1383, 4771-6060, 7906-9258, 14935-16224, 20413-21705 and 25810-27102 of SEQ ID NO: 1; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity.

13. The DNA according to claim 4 wherein the DNA encoding a polypeptide having β-ketoacyl-ACP reductase activity is:

a DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 5143-5676, 10609-11142, 18886-19419, 23602-24138 and 29227-29760 of SEQ ID NO: 1, and nucleotide Nos. 3634-4188, 12547-13104, 19285-19842, 24685-25242 and 30076-30633 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP reductase activity.

14. The DNA according to claim 4 wherein the DNA encoding a polypeptide having dehydratase activity is:

a DNA comprising the nucleotide sequence selected from the group consisting of

nucleotide Nos. 8947-9384 and 27475-27894 of SEQ ID NO: 1, and nucleotide Nos. 10885-11289, 23149-23529 and 28516-28878 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having dehydratase activity.

15. The DNA according to claim 4 wherein the DNA encoding a polypeptide having thioesterase activity is:

a DNA comprising the nucleotide sequence of nucleotide No. 13879-14619 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having thioesterase activity.

16. The DNA according to claim 3 or 4 wherein the DNA encoding avermectin aglycon synthase domains is a mutated DNA encoding a polypeptide having enhanced or diminished activity of the domain.

17. The DNA according to claim 16 wherein the DNA encoding a polypeptide having diminished activity of Avermectin aglycon synthase domain is a DNA comprising the nucleotide sequence of SEQ ID NO: 7.

18. A DNA encoding an Avermectin aglycon synthase domain which comprises a nucleotide sequence selected from the group consisting of: nucleotide Nos. 85-1032, 1096-1353, 1441-2742, 3148-4068, 5143-5676, 5935-6180, 6256-7545, 7906-8829, 8947-9384, 10609-11142, 11413-11658, 12076-13368, 13756-14694, 14902-15147, 15217-16506, 16917-17862, 18886-19419, 19693-19938, 20008-21297, 21658-22584, 23602-24138, 24445-24690, 24781-26079, 26413-27336, 27475-27894, 29227-29760 and 30064-30309 of SEQ ID NO: 1, and nucleotide Nos. 100-1383, 1648-2673, 3634-4188, 4447-4692, 4771-6060, 6322-7344, 7573-7818, 7906-9258, 9676-10773, 10885-11289, 12547-13104, 13378-13659, 13879-14619, 14935-16224, 16543-17565,

17689-18066, 19285-19842, 20089-20334, 20413-21705, 21991-23019, 23149-23529, 24685-25242, 25489-25734, 25810-27102, 27367-28392, 28516-28878, 30076-30633 and 30880-31125 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having avermectin aglycon synthase domain activity.

19. A DNA comprising the nucleotide sequence of nucleotide No. 85-1353 of SEQ ID NO: 1 ;or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having acyltransferase activity and acyl carrier protein activity.

20. A DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 1441-6180, 15217-19938, and 20008-24690 of SEQ ID NO: 1, and nucleotide Nos. 100-4692 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, β-ketoacyl-ACP reductase activity and acyl carrier protein activity.

21. A DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 6256-11658, and 24781-30309 of SEQ ID NO: 1, and nucleotide Nos. 14935-20334, 20413-25734 and 25810-31125 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, dehydratase activity, β-ketoacyl-ACP reductase activity and acyl carrier protein activity.

22. A DNA comprising the nucleotide sequence of nucleotide No. 12076-15147 of SEQ ID NO: 1, or the nucleotide sequence of nucleotide No. 4771-7818 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes

a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, and acyl carrier protein activity.

23. A DNA comprising the nucleotide sequence of nucleotide No. 7906-14619 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity, acyltransferase activity, dehydratase activity, β-ketoacyl-ACP reductase activity, acyl carrier protein, and thioesterase activity.

24. A DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 85-1032, 7906-8829, 13756-14694, 16917-17862, 21658-22584 and 26413-27336 of SEQ ID NO: 1, and nucleotide Nos. 1648-2673, 6322-7344, 9676-10773, 16543-17565, 21991-23019 and 27367-28392 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having acyltransferase activity.

25. A DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 1096-1353, 5935-6180, 11413-11658, 14902-15147, 19693-19938, 24445-24690 and 30064-30309 of SEQ ID NO: 1, and nucleotide Nos. 4447-4692, 7573-7818, 13378-13659, 20089-20334, 25489-25734 and 30880-31125 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having acyl carrier protein activity.

26. A DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 1441-2742, 6256-7545, 12076-13368, 15217-16506, 20008-21297, and 24781-26079 of SEQ ID NO: 1 and nucleotide Nos. 100-1383,

4771-6060, 7906-9258, 14935-16224, 20413-21705 and 25810-27102 of SEQ ID NO: 1; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP synthase activity.

27. A DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 5143-5676, 10609-11142, 18886-19419, 23602-24138 and 29227-29760 of SEQ ID NO: 1, and nucleotide Nos. 3634-4188, 12547-13104, 19285-19842, 24685-25242 and 30076-30633 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having β-ketoacyl-ACP reductase activity.

28. A DNA comprising the nucleotide sequence selected from the group consisting of nucleotide Nos. 8947-9384 and 27475-27894 of SEQ ID NO: 1, and nucleotide Nos. 10885-11289, 17689-18066, 23149-23529 and 28516-28878 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having dehydratase activity.

29. A DNA comprising the nucleotide sequence of nucleotide Nos. 13879-14619 of SEQ ID NO: 2; or

a DNA which hybridizes with said DNA under stringent conditions and which encodes a polypeptide having thioesterase activity.

30. A DNA comprising the nucleotide sequence shown in SEQ ID NO: 7.

31. A polypeptide encoded by the DNA according to any one of claims 1 to 29.

32. A polypeptide comprising an amino acid sequence according to any one of

SEQ ID NOS: 3 to 6; or

a polypeptide comprising an amino acid sequence wherein one or more amino acids are deleted, replaced or added in the amino acid sequence according to any one of SEQ ID NOS: 3 to 6, and having avermectin aglycon synthase activity.

33. A polypeptide comprising the amino acid sequence selected from the group consisting of amino acid Nos. 29-344, 366-451, 481-914, 1050-1356, 1715-1892, 1979-2060, 2086-2515, 2983-3128, 3537-3714 and 3805-3886 of SEQ ID NO: 3, amino acid Nos. 36-466, 596-908, 978-1059, 1083-1512, 1653-1964, 2306-2483, 2575-2656, 2680-3109, 32030-3538, 3878-4056, 4159-4240, 4271-4703, 4815-5122, 5753-5930 and 6032-6113 of SEQ ID NO: 4, amino acid Nos. 34-461, 550-891, 1212-1396, 1483-1564, 1591-2020, 2108-2448, 2525-2606, 2636-3086, 3226-3591, 3629-3763, 4183-4363, 4460-4553 and 4627-4873 of SEQ ID NO: 5, amino acid Nos. 38-467, 574-914, 956-1081, 1488-1673, 1756-1837, 1864-2294, 2390-2732, 2776-2902, 3288-3473, 3556-3637, 3663-4093, 4182-4523, 4565-4685, 5085-5270 and 5353-5434 of SEQ ID NO: 6; or

a polypeptide comprising an amino acid sequence wherein one or more amino acida are deleted, replaced or added in the amino acid sequence selected above, and having avermectin aglycon synthase domain activity.

34. A recombinant vector comprising the DNA according to any one of claims 1 to 30.

35. A transformant obtainable by introducing the DNA according to any one of claims 1 to 30 or the recombinant vector according to claim 34 into a host cell.

36. The transformant according to claim 35 wherein the host cell is an avermectin-producing bacterial strain.

37. The transformant according to claim 35 or 36 wherein the host cell is *Streptomyces avermitilis* K2038 (FERM BP-2775).

38. A process for producing avermectin aglycon synthase or avermectin aglycon synthase domain polypeptide comprising:
culturing the transformant according to any one of claims 35 to 37 in a medium to produce and accumulate the enzyme or the domain polypeptide in the culture, and
recovering the enzyme or the domain polypeptide from the culture.

39. A process for producing avermectin aglycon or altered avermectin aglycon comprising:

culturing a transformant according to any one of claims 35 to 37 in a medium to produce and accumulate the avermectin aglycon or the altered avermectin aglycon in the culture, and

recovering the avermectin aglycon or the altered avermectin aglycon from the culture.

40. A process for producing avermectin or altered avermectin comprising:
culturing a transformant according to any one of claims 35 to 37 in a medium to produce and accumulate the avermectin aglycon or the altered avermectin aglycon in the culture,
glycosylating the avermectin aglycon or the altered avermectin glycon, and
recovering the resulting avermectin or altered avermectin.

41. The process according to claim 40 wherein altered avermectin is avermectin which has been altered from avermectin B1a to avermectin B2a.

42. An altered avermectin obtainable by the process according to claim 40.

43. An oligonucleotide having a sequence corresponding to 5 to 60 continuous nucleotides in the nucleotide sequence of the DNA according to claim 1 or 2; or an oligonucleotide having a sequence complementary to the oligonucleotide.